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TITLE: STRUCTURE OF AIR COOLER

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ABSTRACT:

PURPOSE: To construct a power generator in a small size, enhance the low temp. starting characteristics, and reduce emission of the exhaust gas (in particular, in the form of particulate).

CONSTITUTION: Suction gas is compressed by a supercharger 1 and supplied to an engine 2 through suction gas passages 3, 3' which are fitted with a suction gas cooler 4. In this suction gas cooling device, a selector valve 5 is furnished in the suction gas passages 3, and the suction gas cooler 4 is connected with one of the branch paths while a suction gas heater 6 is connected with the other branch path, wherein passages 7, 7' supplied with a cooling water from the engine are connected with this suction gas heater 6, and further a controller 8 is furnished which operates the selector valve 5. The controller 8 is equipped with a function to switch the suction gas so that the valve 5 is changed over to the suction gas cooler side when the load is large and to the suction gas heater side when the load remains small.

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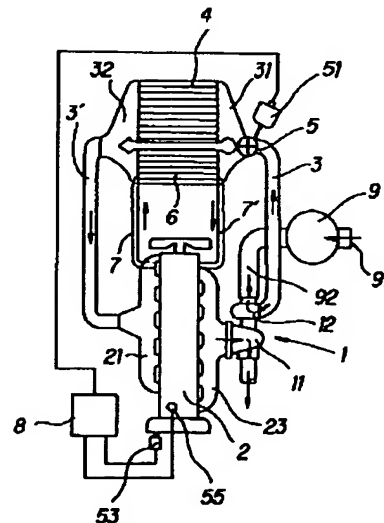
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(54)【発明の名称】 吸気冷却器の構造

(57)【要約】

【目的】 発電機を小型化し、低温始動性の向上と排ガス（特にバティキュレート）低減を図ること。

【構成】 過給機（1）により吸気を圧縮してエンジン（2）に供給する吸気通路（3）、（3'）を備え、その吸気通路（3）、（3'）に吸気冷却器（4）を有する吸気冷却装置において、前記吸気通路（3）に切り替えバルブ（5）を設け、一方の分岐路に吸気吸気冷却器（4）を接続し、他方の分岐路に吸気加熱器（6）を接続し、該吸気加熱器（6）にはエンジンからの冷却水が供給される通路（7）、（7'）が接続され、前記切り替えバルブ（5）を作動させるコントローラ（8）を設け、該コントローラ（8）は負荷が大のときは吸気切り替えバルブ（5）を吸気冷却器（4）側に、負荷が小のときは吸気加熱器（6）側に吸気を切替える機能を有している。



## 【特許請求の範囲】

【請求項1】過給機により吸気を圧縮してエンジンに供給する吸気通路を備え、その吸気通路に吸気冷却器を有する吸気冷却装置において、該吸気通路に切り替えバルブを設け、一方の分岐路に吸気冷却器を接続し、他方の分岐路に吸気加熱器を接続し、該吸気加熱器にはエンジンからの冷却水が供給される通路が接続され、前記切り替えバルブを動作させるコントローラを設け、該コントローラは負荷が大のときは吸気切り替えバルブを吸気冷却器側に、負荷が小のときは吸気加熱器側に吸気を切替える機能を有することを特徴とする吸気冷却器の構造。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、過給機により吸気を圧縮してエンジンに供給する吸気通路を備え、その吸気通路に吸気冷却器を有する吸気冷却装置に関する。

## 【0002】

【従来の技術】従来、吸気冷却器において複数のバイパス回路を設け、吸気の冷却能力を可変とした技術は実開昭58-139524号、実開昭60-110628号公報等に開示されている。しかしこの場合吸気を積極的に加熱することが出来ないで低温始動性が悪化した。図4に示すように、低負荷運転時にはバティキュレートを増加させてしまうという問題があった。

【0003】この問題を解決するために、例えば図5の全体構成図と図6の制御ブロック図に示すように、吸気冷却器をバイパスさせるバイパス通路と、そのバイパス通路内にヒータを用いて吸気を加熱する技術は知られている（例えば、実開平2-28532号公報等参照）。尚、図5中2はエンジン、1は過給器、30は吸気管、40はインタークーラ、30はバイパス通路、5は切替弁、60はヒータを示す。

## 【0004】

【発明が解決しようとする課題】しかしながら、上記のように従来技術においては吸気の加熱を電熱ヒータによっているため、多量の電力を消費し、車両の発電機の大規模化が不可避という問題があった。

【0005】そこで本発明ではこの問題を解決するために、電気的手段を用いずにエンジンの運転状況に応じて吸気を適性温度に冷却、あるいは加熱できる構造とし、発電機を小型化し、低温始動性の向上と排ガス（特にバティキュレート）低減を図ることを目的とする。

## 【0006】

【課題を解決するための手段】本発明によれば、過給機により吸気を圧縮してエンジンに供給する吸気通路を備え、その吸気通路に吸気冷却器を有する吸気冷却装置において、該吸気通路に切り替えバルブを設け、一方の分岐路に吸気冷却器を接続し、他方の分岐路に吸気加熱器を接続し、該吸気加熱器にはエンジンからの冷却水が供給される通路が接続され、前記切り替えバルブを動作させ

るコントローラを設け、該コントローラは負荷が大のときは吸気切り替えバルブを吸気冷却器側に、負荷が小のときは吸気加熱器側に吸気を切替える機能を有している。

## 【0007】

【作用】本発明は上記のように構成されているので、発電機を小型化でき、エンジンの回転、負荷条件毎に適正な温度の吸気を燃焼室に供給でき、動力性能の向上及び排ガス（特にバティキュレート）の低減が可能となる。

## 【0008】

【実施例】以下、本発明の実施例を添付図面によって説明する。

【0009】図1において、エアクリーナ9は通気管92を介して過給器1のコンプレッサ12の入口側に連通している。また、前記過給器1のタービン11側は排気マニフォールド23と接続され、前記コンプレッサ12と前記タービン11は同軸で接続されている。そして前記コンプレッサ12の出口側には吸気通路3の一端が接続され、他端は吸気冷却器4の入口側と吸気加熱器6の入口側に分岐する分岐管31の入口側にアクチュエータ51により作動する切り替えバルブ5を介して接続されている。また前記吸気冷却器4の出口と吸気加熱器6の出口は合流管32で接続され、該合流管32は通気通路3によって吸気マニフォールド21に連通している。

【0010】また、前記吸気加熱器6のコアはエンジン冷却水通路7、7によってエンジン2の図示しないウォータマニフォールドと連通しており、エンジンにより温められた冷却水によって吸気加熱器6を通過する吸気を暖める。

【0011】更にエンジン2には回転センサ53と負荷センサ55が取り付けられており、これらにより回転数と負荷情報を得たコントローラ8は例えば、図2に示す吸気温度制御領域図により制御信号をアクチュエータ51に送る。

【0012】次に吸気の温度制御の過程を図1及び図3を用いて説明する。

【0013】まずスタートして、初期状態として切り替えバルブ5を吸気冷却器4側にセットし、ステップ2に進み、回転センサ53からの情報によりエンジンが運転中であるか否かを判断し、エンジン運転中（この時、吸気口91から取り込まれたエアはエアクリーナ9で清浄され、通気管92を経て過給器1のコンプレッサ12で吸気は圧縮され吸気通路3を経て、切り替えバルブ5を介して吸気冷却器4に送り込まれ、吸気冷却器4により冷却され、吸気通路3、吸気マニフォールド21を経て図示しない燃焼室に送り込まれている。）であればステップ3に進む。

【0014】そして、回転センサ53と負荷センサ55からの情報によりコントローラ8がエンジン運転条件を図2の領域Aと判断すればステップ4に進み、切り替えバルブ5が吸気冷却器4側であればステップ5に進み、ア

クチュエータ51に制御信号を送りこれを作動させ、切替えバルブ5により吸気の流れを吸気加熱器6側へと切替え、ステップ2に戻る。

【0015】また、切替えバルブ5が吸気冷却器側でなければそのままステップ2に戻る。また、ステップ3においてエンジン運転条件が領域Aでない場合、即ち、図2の領域Bであればステップ6に進み、切替えバルブ5が吸気加熱器6側であればステップ7に進み、アクチュエータ51に制御信号を送りこれを作動させ、切替えバルブ5により吸気の流れを吸気冷却器4側へと切替え、ステップ2に戻る。また、切替えバルブ5が吸気加熱器側でなければそのままステップ2に戻る。また、ステップ2において、エンジンが停止状態であれば制御を終了する。

【0016】

【発明の効果】本発明は上記のように構成されているので、以下の優れた効果を奏する。

(1) 発電機を小型化でき、(2) 低温始動性を向上し、(3) 排ガス（特にバティキュレート）低減を図ることが出来る。

【図面の簡単な説明】

【図1】実施例の全体構成図

【図2】実施例の吸気温度制御領域図

【図3】実施例のコントローラ制御フロー図

【図4】吸気温度による排ガス中の有害物質質量の変化を示すグラフ

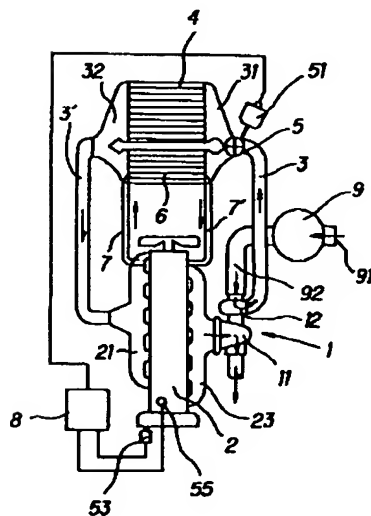
【図5】従来例の全体構成図

【図6】図5のシステムブロック図

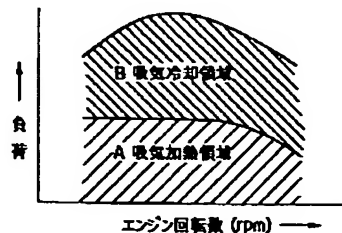
【符号の説明】

- 1、1'・・・過給器
- 2、2'・・・エンジン
- 3、3'・・・吸気通路
- 4、40・・・吸気冷却器
- 5、5'・・・切替えバルブ
- 6・・・吸気加熱器
- 7、7'・・・エンジン冷却水通路
- 8・・・コントローラ
- 9・・・エアクリーナ
- 11・・・タービン
- 12・・・コンプレッサ
- 21・・・吸気マニフォールド
- 23・・・排気マニフォールド
- 30・・・吸気管
- 30'・・・バイパス通路
- 31・・・分岐管
- 53・・・回転センサ
- 55・・・負荷センサ
- 60・・・ヒータ

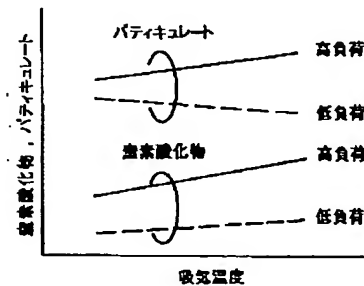
【図1】



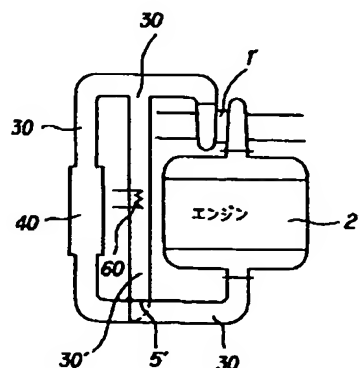
【図2】



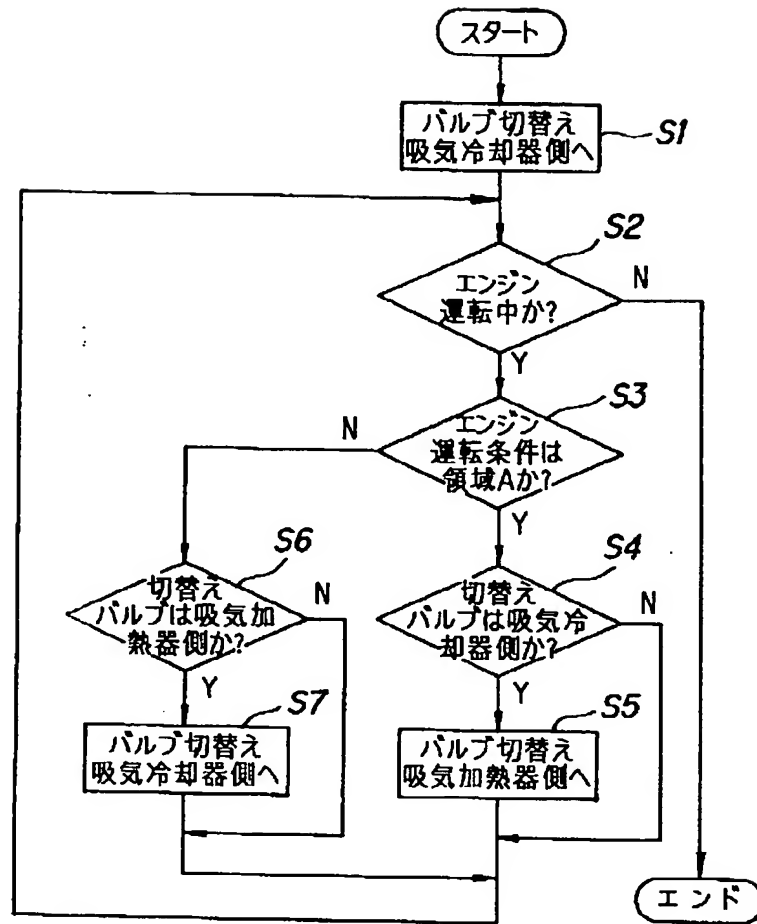
【図4】



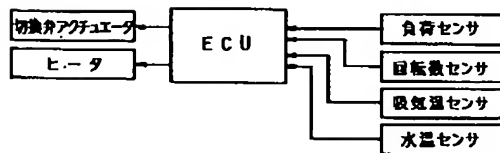
【図5】



【図3】



【図6】



# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : NISSAN DIESEL MOTOR CO LTD

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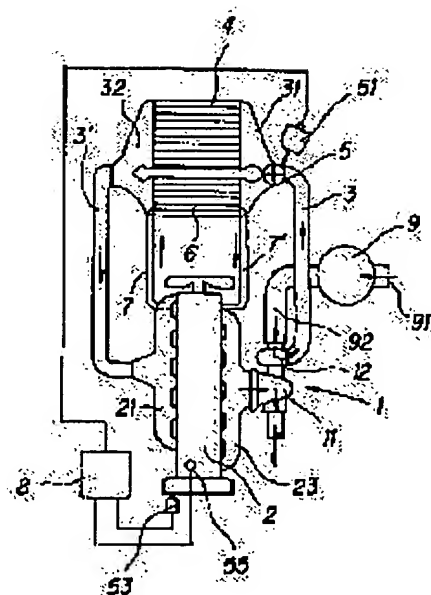
(72)Inventor : HARAYAMA NAOYA

## (54) STRUCTURE OF AIR COOLER

### (57)Abstract:

**PURPOSE:** To construct a power generator in a small size, enhance the low temp. starting characteristics, and reduce emission of the exhaust gas (in particular, in the form of particulate).

**CONSTITUTION:** Suction gas is compressed by a supercharger 1 and supplied to an engine 2 through suction gas passages 3, 3' which are fitted with a suction gas cooler 4. In this suction gas cooling device, a selector valve 5 is furnished in the suction gas passages 3, and the suction gas cooler 4 is connected with one of the branch paths while a suction gas heater 6 is connected with the other branch path, wherein passages 7, 7' supplied with a cooling water from the engine are connected with this suction gas heater 6, and further a controller 8 is furnished which operates the selector valve 5. The controller 8 is equipped with a function to switch the suction gas so that the valve 5 is changed over to the suction gas cooler side when the load is large and to the suction gas heater side when the load remains small.



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CLAIMS

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[Claim(s)]

[Claim 1] In the inhalation-of-air cooling system which is equipped with the inhalation-of-air path which compresses inhalation of air with a supercharger and is supplied to an engine, and has an inhalation-of-air condensator to the inhalation-of-air path Change to this inhalation-of-air path, prepare a bulb, and an inhalation-of-air condensator is connected to one fork road. Connect an intake air heater to the fork road of another side, and the path to which the cooling water from an engine is supplied is connected to this intake air heater. This controller is the structure of an inhalation-of-air condensator where it is characterized by having the function to change inhalation of air to an intake-air-heater side when the controller which operates said change bulb is formed and a load is [ a load ] smallness about an inhalation-of-air change bulb at an inhalation-of-air condensator side at the adult time.

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[Translation done.]



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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention is equipped with the inhalation-of-air path which compresses inhalation of air with a supercharger and is supplied to an engine, and relates to the inhalation-of-air cooling system which has an inhalation-of-air condensator to the inhalation-of-air path.

[0002]

[Description of the Prior Art] Conventionally, two or more bypass circuits are prepared in an inhalation-of-air condensator, and the technique which made refrigeration capacity of inhalation of air adjustable is indicated by JP,58-139524,U, JP,60-110628,U, etc. However, there was a problem of low-temperature startability getting worse, since inhalation of air cannot be positively heated in this case, or making a particulate increase at the time of low load driving, as shown in drawing 4.

[0003] The technique of using a heater into the bypass path which makes an inhalation-of-air condensator bypassing, and its bypass path, and heating inhalation of air in order to solve this problem, for example, as shown in the whole drawing 5 block diagram and control-block drawing of drawing 6 is known (for example, reference, such as JP,2-28532,U). in addition, 2 in drawing 5 ' -- an engine and 1' -- in a supercharger and 30, a bypass path and 5' show a change-over valve, and, as for an inlet pipe and 40, 60 shows a heater, as for an intercooler and 30'.

[0004]

[Problem(s) to be Solved by the Invention] However, since heating of inhalation of air was depended on the electrical heater in the above conventional technique, a lot of power was consumed and there was a problem that enlargement of the generator of a car was unescapable.

[0005] Then, in order to solve this problem in this invention, it considers as the structure where an engine operation situation is embraced without using an electric means, and inhalation of air can be cooled or heated to appropriate temperature, and a generator is miniaturized and it aims at aiming at improvement and exhaust gas (especially particulate) reduction of low-temperature startability.

[0006]

[Means for Solving the Problem] In the inhalation-of-air cooling system which is equipped with the inhalation-of-air path which according to this invention compresses inhalation of air with a supercharger and is supplied to an engine, and has an inhalation-of-air condensator to the inhalation-of-air path Change to this inhalation-of-air path, prepare a bulb, and an inhalation-of-air condensator is connected to one fork road. Connect an intake air heater to the fork road of another side, and the path to which the cooling water from an engine is supplied is connected to this intake air heater. The controller which operates said change bulb is formed and, as for this controller, the load has the function to change inhalation of air to an intake-air-heater side when a load is smallness about an inhalation-of-air change bulb at an inhalation-of-air condensator side at the adult time.

[0007]

[Function] Since this invention is constituted as mentioned above, it can miniaturize a generator, and can supply the inhalation of air of proper temperature to a combustion chamber for every revolutions of an

engine and load conditions, and the improvement in the power engine performance and the reduction of exhaust gas (especially particulate) of it are attained.

[0008]

[Example] Hereafter, an accompanying drawing explains the example of this invention.

[0009] In drawing 1, the air cleaner 9 is open for free passage to the entrance side of the compressor 12 of a supercharger 1 through a vent pipe 92. Moreover, the turbine 11 side of said supercharger 1 is connected with the exhaust air manifold 23, and said compressor 12 and said turbine 11 are connected on the same axle. And the end of the inhalation-of-air path 3 is connected to the outlet side of said compressor 12, and the other end is connected to the entrance side of the branch pipe 31 which branches to the entrance side of the inhalation-of-air condenser 4, and the entrance side of an intake air heater 6 through the change bulb 5 which operates with an actuator 51. Moreover, the outlet of said inhalation-of-air condenser 4 and the outlet of an intake air heater 6 are connected with a junction pipe 32, and this junction pipe 32 is open for free passage to the inhalation-of-air manifold 21 with aeration path 3'.

[0010] Moreover, the core of said intake air heater 6 is open for free passage with the engine-cooling-water path 7 and the water manifold which an engine 2 does not illustrate by 7', and warms the inhalation of air which passes an intake air heater 6 with the cooling water which was able to be warmed with the engine.

[0011] Furthermore, the revolution sensor 53 and the load sensor 55 are attached in the engine 2, and the controller 8 which acquired a rotational frequency and load information by these sends a control signal to an actuator 51 with intake-air-temperature regulatory region drawing shown in drawing 2.

[0012] Next, the process of the temperature control of inhalation of air is explained using drawing 1 and drawing 3.

[0013] Start first, change as an initial state and a bulb 5 is set to the inhalation-of-air condenser 4 side. Progress to step 2 and it judges whether an engine is operating using the information from the revolution sensor 53. Under engine operation (clarification of the air incorporated from the inlet port 91 is carried out with an air cleaner 9 at this time) pass a vent pipe 92 -- inhalation of air should be compressed by the compressor 12 of a supercharger 1, and pass the inhalation-of-air path 3 -- be sent into the inhalation-of-air condenser 4 through the change bulb 5, be cooled by the inhalation-of-air condenser 4, and pass inhalation-of-air path 3' and the inhalation-of-air manifold 21 -- it is sent into the combustion chamber which is not illustrated. it is -- if -- it progresses to step 3.

[0014] And if a controller 8 judges engine operation conditions to be the fields A of drawing 2 using the information from the revolution sensor 53 and the load sensor 55, it will progress to step 4, if the change bulb 5 is the inhalation-of-air condenser 4 side, it will progress to step 5, and a control signal is sent to an actuator 51, this is operated, the flow of inhalation of air is changed to an intake-air-heater 6 side by the change bulb 5, and it returns to step 2.

[0015] Moreover, if the change bulb 5 is not an inhalation-of-air condenser side, it will return to step 2 as it is. Moreover, when engine operation conditions are not Fields A in step 3, if it is the field B of drawing 2 R> 2, it will progress to step 6, if the change bulb 5 is an intake-air-heater 6 side, it will progress to step 7, and a control signal is sent to an actuator 51, this is operated, the flow of inhalation of air is changed to the inhalation-of-air condenser 4 side by the change bulb 5, and it returns to step 2. Moreover, if the change bulb 5 is not an intake-air-heater side, it will return to step 2 as it is. Moreover, in step 2, if an engine is a idle state, control will be ended.

[0016]

[Effect of the Invention] Since this invention is constituted as mentioned above, the effectiveness which was excellent in the following is done so.

(1) A generator can be miniaturized, (2) low-temperature startability can be improved, and (3) exhaust-gas (especially particulate) reduction can be aimed at.

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[Translation done.]